Specification For Non-Provisional Utility Patent Application

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Status of Inventor	Inventor claims Small Entity Status
TITLE OF INVENTION	**Model Railroad Locomotive Wheel Electrical Contact and Spring Suspension Device, also known as a 'WheelWiper'**

CROSS-REFERENCE TO RELATED APPLICATIONS

This invention is an improvement to a model railroad locomotive such as described in United States Patent Number 4,799,431.

A provisional patent application # 60/465,850 was filed with the USPTO on 28 April 2003 for the present invention under the title "Wheel Contact Whisker".

This present invention was previously disclosed to the USPTO and was issued Disclosure Document No 525317 on 3 Feb 2003.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable.

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISK APPENDIX

Not Applicable

BACKGROUND OF THE INVENTION

Scale model railroad locomotives are generally provided with electric motors for self propulsion through a drive mechanism between the motor(s) and one or more sets of wheels. The electric current to operate these motors is usually collected from electrically conductive spaced apart rails through the wheels or wheels in combination with overhead suspended catenary wiring and associated pickup device.

In the case of current collection utilizing the wheels, often in prior art wiping contacts to provide an electrical connection to those wheels are positioned to ride on the inside surface of the wheels or on supporting axle sections or ends which are electrically connected to the wheels. These contacts are trouble-prone due to collection of dirt in these areas and the resulting necessity to dis-assemble the locomotive to remove this dirt and clean these wiping contacts. In addition, they do not assist in equalized weight distribution amongst all wheels and thus do not gain the improvement in electrical contact pressure that such can achieve.

Some locomotives may not use wiping contacts on the wheels at all and depend instead on the incidental contact between the electrified axles and the bushings in which they are mounted. These are also subject to operational problems when the rubbing electrical contact surfaces get dirty.

Z scale (1:220) model locomotives are by necessity very light weight and can suffer from intermittent loss of electrical contact between the electrified rails and the electrical pickup wheels due to small amounts of dirt and oxide formed on the rail surfaces and the wheel surfaces. To ensure fault free running, the rails and wheels must be kept clean to minimize the random loss of electrical conduction on each wheel, and the internal current conduction of the locomotive must also be designed to maximize electrical contact between the moving parts in the electrical current path to the motor.

In addition, to negotiate vertical imperfections and undulations inherent in model railroad track and associated turnout (track switch) assemblies, especially for smaller scales such as Z scale (1:220), each locomotive wheel must be free to independently travel vertically as it rolls on the rail. The electrical contact between rail, wheel, and locomotive interior electrical systems must be maintained in spite of these vertical wheel movements. In smaller scales especially, where random loss of electrical wheel pickup is a normal occurrence due to the light weight of the locomotive, it is imperative for best performance to ensure that each and every wheel has maximum electrical contact at all times possible. The probability of the locomotive stalling at low speed due to a combined loss of electrical contact on all wheels on one rail at the same time is an inverse exponential function of the reliability and number of functional electrical pickup wheels.

SUMMARY OF THE PRESENT INVENTION

The present invention as specifically described in this embodiment is an electrical pickup improvement and wheel suspension system improvement to a model railroad locomotive wheel, axle, and truck design described under US Patent number 4,799,431 and issued 24 January 1989. An embodiment of the invention described under US Patent number 4,799,431 is currently manufactured by the Micro-Trains® Line company of Talent, Oregon. The design of this locomotive does not include wiping electrical contacts on the wheels; rather electrical conduction between axles and electrical conduction components depends on that obtained via metal axles rotating loosely in the retaining slots formed in cast metal pieces. This model locomotive suffers from regular stalling due to erratic electrical conduction when the locomotive is run at slow speeds due to slight amounts of dirt buildup in the metal slots in which the electrified axles rotate and thus random prevention of the flow of electrical current to the locomotive motor. Even at medium to high speeds performance in many instances has been shown to be less than adequate to varying degrees. If all wheels to either of the two rails of the model railroad track should happen to lose electrical contact at the same time, the locomotive will 'stall' (stop running), and must be manually pushed or shaken to re-establish the electrical contact to start it moving again.

The present invention is a wiping contact made of a springy metal material. It's physical shape in the described embodiment allows installation into the particular make and model of the existing locomotive design described under US Patent number 4,799,431 in such a manner as to allow after-market sale and installation of this wiping contact by the consumer-owner of this particular locomotive.

In more general usage as applied to other model railroad locomotives of different manufacture it may be designed to perform two distinct functions in a similar manner to the functions described when used with the above locomotive:

1. The present invention achieves electrical contact to the wheel by resting on and bearing gently against the top flat surface of the wheel, known as the wheel tread and is separate and distinct from the wheel flange or axle. This surface is the portion of the wheel that makes contact with the rail of the model railroad track under normal rotational use. The wheel tread electrical contact to the rail is kept clean by the action of manual cleaning of the wheel tread, a normal and regular maintenance activity by the model railroad enthusiast. No dis-assembly of the locomotive is required to do this; rather a battery or other power source can be held against one set of wheels causing all wheels to spin. A soft cloth wetted with a liquid cleaning solvent is held against each spinning wheel tread in turn. This cleans dirt off the wheel tread surface, and at the same time transfers the wet cleaning solvent to the present invention wiping contact where rubbing friction from the wheel surface wipes the dissolved dirt from the wiping contact.

2. The slight downward pressure of the springy, flexible wiping contact forces all wheels into their most downwards position when they are not supporting the weight of the locomotive. The slight vertical travel of the individual wheels paired on their axles causes them to spring upwards into their uppermost position when supporting the weight of the locomotive. Since the supporting railroad track is never perfectly flat, not all wheels will be forced upwards to their mechanical design limit. As the locomotive rolls on the track, each wheel will equalize and adjust itself under this downwards spring pressure to maintain physical and electrical contact with both the rail and the wiping contact/spring, no matter what orientation the entire truck assembly happens to be in at any given time. This ensures maximum electrical conduction between the rails and each and every wheel and the locomotive electrical system.

It has been shown by many owners of these model railroad locomotives that the addition of the present invention described herein results in far superior operational reliability and performance.

DESCRIPTION OF THE DRAWINGS

Of all items shown in the described drawings, only the present invention 'WheelWiper' is the claimed invention; all other parts shown are part of the prior art invention described in United States Patent Number 4,799,431.

FIG. 1 is an exploded isometric drawing of a truck assembly showing only the necessary related items that pertain to the immediate invention. Certain aspects of electrical conduction and motive force for wheel rotation are not relevant to the invention and are thus not shown in order to improve clarity.

FIG. 2 shows the invention alone in the shape in which it is manufactured and prior to forming bends.

FIG. 3 is a top view of a truck assembly showing the placement of the present invention.

FIG. 4 is a side view of the partially disassembled truck showing the action of the present invention.

FIG. 5 is an end view of the partially disassembled truck showing the action of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

To maintain consistency with prior art United States Patent Number 4,799,431, all prior art items described here in the Figures and the Description retain the original assigned reference numbers and names as used in the original prior art patent. Where multiple reference numbers were used in the prior art patent for similar parts, only the lowest number is retained without alphabetic character if used. The present invention 'WheelWiper' is assigned reference number 1.

FIG. 1 indicates the order of assembly of relevant parts in a single truck assembly. Refer to United States Patent Number 4,799,431 for a full description; this is briefly summarized here for only the relevant items. The present invention WheelWiper 1 is installed in pairs in all truck assemblies of the locomotive, only one truck is described here as other truck and wheel assemblies are virtually identical.

Truck frame 32 shown in simplified form is molded from non-conductive plastic and serves to hold the truck assembly together in combination with screws 26 and the threaded holes in conductive metal castings which form the gimbal bodies 96. The gimbal bodies 96 are integral parts of the electrical conduction path to the locomotive motor, details of this function are not relevant to the present invention and are not described herein. Truck frame 32 has cutouts in its bottom floor section to allow gear 51 clearance and to allow the wheels 52 to protrude below truck frame 32 and thus roll on the rails of model railroad track.

Conductive flanged wheels 52 are formed with integral conductive shafts which are mounted to and separated by non-conductive axle gears 51. (These shafts in effect form an axle, but to maintain the naming conventions and terminology used in United States Patent Number 4,799,431, the term 'axle' will not be used herein to describe this shaft.) Axle gears 51 serve to electrically isolate and provide motive rotational force to

wheels 52 through a gear sandwiched between gimbal bodies 96; this gear function is not relevant to the present invention and is not shown herein. The integral shafts of wheels 52 rotate within the slots of gimbal bodies 96 and provide the electrical conduction path between the wheels 52 and the gimbal bodies 96. The shape of the slots in gimbal bodies 96 allows the wheels 52 to have a limited amount of vertical play in order to follow vertical undulations of the railroad track rails. The upper limit of this vertical play is set by the slot height, at their lower limit of vertical travel the wheels 52 are retained in their respective slots of gimbal bodies 96 by the bottom floor section of truck frame 32.

The electrical contact and conduction between the shafts of wheels 52 and the slots of gimbal bodies 96 is a weak point in this design. Because of the necessary looseness and free play to allow wheels 52 to rotate and move vertically without binding, and due to the presence of lubrication compounds, this electrical contact is inherently random and erratic and quickly degrades as dirt builds up within this area.

The present invention WheelWipers 1 are formed in pairs to fit around the threaded hole extended portion of each gimbal body 96 and nest between the gimbal bodies 96 and the corresponding retaining areas in truck frame 32. The WheelWipers 1 are retained in position by screws 26 along with the remainder of the assembly as previously described.

The elongated sections of the present invention WheelWipers 1 are formed to ride on the top surfaces of wheels 52 and provide slight downwards suspension pressure and optimized electrical contact between the wheels 52 through the WheelWipers 1 to the gimbal bodies 96 by nature of the physical contact to each.

This particular mounting method of the invention allows after-market installation of the invention WheelWipers 1 into existing truck assemblies by the user/owner of the model railroad locomotive as a performance upgrade simply by dis-assembling the trucks and

re-assembling with the WheelWipers 1 installed. No other modification to the original truck components is required.

FIG. 2 depicts the present invention WheelWiper 1 in a form suitable for the described embodiment in the particular model railroad locomotive described above as prior art in United States Patent Number 4,799,431; and created by photo-etching a suitable thin sheet of conductive and somewhat springy stock material such as phosphor-bronze that can be shaped into the final required bent shape without breaking. This flat form is highly suitable for easy packaging and shipping to a customer without damage and allows large quantities to be easily mass produced from each sheet of stock material.

FIG. 3 shows the truck assembly from the top. The WheelWipers 1 are formed to ride on the treads of the wheels 52. In this figure the truck frame 32 is shown.

FIG. 4 shows the truck assembly from the side and illustrates the action of the present invention WheelWiper 1 to follow the vertical movements of the wheels 52. The truck frame is not shown for clarity and one side only of front and rear wheels 52 are shown in alternate positions of vertical travel within the non-visible slots of gimbal body 96. The WheelWiper 1 is formed to remain in contact with each wheel in the lowest position of vertical travel, but will spring upwards to allow the wheel to rise to its upper limit of vertical travel as railroad track conditions require.

The model locomotive weight is suspended on gimbal bodies 96 and under perfectly flat conditions all wheels 52 are forced to their uppermost positions of vertical travel by the weight of the locomotive. When the wheels traverse normal and unavoidable railroad track undulations, one or more wheels is required to dip downwards; without the spring suspension feature of the WheelWiper 1 this dip results from gravity alone. The resulting loss of pressure from locomotive weight on that one wheel can interrupt

electrical contact either between the wheel 52 and rail, or between the wheel 52 and the corresponding slot of gimbal body 96. Dirt in the wheel 52 and slot of gimbal body 96 further aggravates the random loss of electrical contact. Since the probability of total interruption of electrical current (and thus stoppage of the locomotive motor) is a statistical probability function of all wheels 52 on each rail losing conduction at the same time, the additional electrical contact reliability of the above described process afforded by the invention ensures that the model locomotive performance is no longer compromised.

FIG. 5 shows the truck from the end with wheels in alternate position of vertical travel. Each wheel is free to travel independently so the wheels 52 can tilt as shown in addition to both moving in the same vertical direction at the same time. Again the truck sideframe is not shown for clarity of illustration of wheel 52 movement and WheelWiper 1 action.

Those of ordinary skill in the art will recognize that many modifications and variations of the present invention may be implemented without departing from the spirit and scope of the present invention. For example, various methods of affixing the springy wiping electrical contact to the internal members of the model locomotive are possible depending on the mechanical design of that particular locomotive. The foregoing description and the following claims are intended to cover such modifications and variations.